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Correlations Between the Wide Range Intelligence Test (WRIT) and the Wechsler Abbreviated Scale of Intelligence (WASI): Global and Subtest Comparisons

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Correlations Between the Wide Range Intelligence Test (WRIT) and the Wechsler
Abbreviated Scale of Intelligence (WASI): Global and Subtest Comparisons

BY

Jason M. Collins

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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Abstract

To assess the convergent validity of the Wide Range Intelligence Test (WRIT) and the Wechsler Abbreviated Scale of Intelligence (WASI), two new brief IQ measures, 66 participants from five rural Illinois public schools were administered both measures in counterbalanced order. All correlations between the WRIT and the WASI were significant. Correlations between the WRIT and the WASI were moderate to high, ranging from .50 ($r^2 = .25$) to .85 ($r^2 = .72$). The WRIT and the WASI appear to be measuring very similar constructs, indicating strong evidence of convergent validity.

Introduction

Intelligence testing is a recent endeavor of mankind. As little as one hundred years ago, intelligence testing, as we know it today, was virtually unheard of. At that point in time Galton developed what is generally considered to be the first “comprehensive individual intelligence test” (Beres, Kaufman, & Perlman, 2000, p. 66). Galton’s test differs from modern intelligence tests in its reliance on sensory discrimination and sensory motor coordination tasks as a measure of intelligence. Galton felt that those people with the highest intelligence should have the greatest motor and sensory abilities. James McKeen Cattell was an assistant to Galton in the late 1800’s, and he was credited with bringing the concepts developed by Galton to the United States. Cattell was also credited with the idea of standardizing the administration of intelligence tests (Beres, Kaufman, & Perlman, 2000).

Following Galton and Cattell were Binet and Simon, who in 1905 ushered in the modern era of intelligence testing when they developed the first modern scale of intelligence (Beres, Kaufman, & Perlman, 2000). Binet and Simon made a radical departure from the theories of Galton and Cattell when they created their test based on the theory that intelligence could be better measured through higher mental processes such as memory, comprehension, and imagination rather than through sensory and motor capabilities (Beres, Kaufman, and Perlman, 2000). This scale was revised and expanded numerous times since its original 30-item format. Binet and Simon’s test was modified and standardized in the U.S. by Termin (Stanford Binet; Thorndike, Hagen, & Sattler, 1986). Although some practitioners utilize the Fourth Edition (SB-IV, Thorndike, Hagen,

& Sattler, 1986), the Wechsler Scales are the most frequently used tests of intelligence (Stinnett, Havey, Oehler-Stinnett, 1994).

David Wechsler noticed some shortcomings of the Stanford Binet Intelligence Test. The first was that the Stanford Binet contained some items that lacked validity. The second was that the Stanford Binet was limited in its scope with regard to age. It was the second of these two shortcomings that prompted Wechsler to design the Wechsler-Bellevue Scale of Intelligence (Wechsler, 1939). Wechsler wanted to have a scale that could provide insight into the intelligence of the adults he was overseeing at Bellevue hospital. On the Wechsler-Bellevue, subtests and items were “borrowed from other tests of cognitive ability” (Beres, Kaufman, & Perlman, 2000, p. 67), and combined into one comprehensive test of intelligence. Since the creation of the Wechsler-Bellevue, Wechsler and the Psychological Corporation have revised and extended the Wechsler-Bellevue into other scales of intelligence including the Wechsler Adult Intelligence Scale (WAIS, 1955; WAIS-R, 1981; WAIS-III, 1997), Wechsler Intelligence Scale for Children (WISC, 1949; WISC-R, 1974; WISC-III, 1991), and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI, 1967; WPPSI-R, 1989).

Over the years, the workloads of many school psychologists have grown greatly resulting in a drastic increase in time spent on evaluations. Historically, most intelligence tests have taken anywhere from 1 to 2 hours or more to administer, score, and interpret. Because of the length of most intelligence tests, many attempts have been made to produce a short and reliable test of intelligence. “Since the publication of the original Wechsler-Bellevue, a large number of abbreviated scales or short forms have been proposed for the Wechsler Scales” (Anastasi, & Urbina, 1997, p. 217). According to

Anastasi and Urbina (1997), short forms of intelligence tests were usually constructed by omitting subtests altogether or by reducing the number of items used in each subtest. Silverstein (1990) raised questions regarding the procedures used when deriving abbreviated scales of intelligence. For example, the full-scale norms of a test may not be applicable when they are prorated for abbreviated forms of the same test. Anastasi and Urbina (1997) suggested that it was inadvisable to use abbreviated tests unless it is for screening purposes.

Until recently, there were very few tests specifically designed and normed for brief administration. The most frequently used of these tests is the Kaufman Brief Intelligence Test (K-BIT, Kaufman & Kaufman, 1990). The K-BIT was the only available option for nearly a decade when conducting a brief measure of cognitive ability. The K-BIT was not a shortened version of any other Kaufman batteries; rather it was designed and standardized independently.

Validity and reliability information for the K-BIT was obtained from 2022 individuals ages 4-90. Split half reliability was determined by using an odd-even split of the items on the test. The split-half correlation coefficients for the K-BIT were as follows: Vocabulary ($r = .93$), Matrices ($r = .88$), and IQ Composite ($r = .94$) suggesting that the test has a high level of internal consistency. The K-BIT's test-retest reliability was assessed with testing intervals ranging from 12 to 145 days (r s ranging from .92 to .95). The results of the test-retest reliability estimates show a mean increase from the first test administration to the second test administration of three standard score points. The correlation between the two K-BIT subtests ($r = .59$) was moderate, suggesting that the

two subtests are measuring similar but not identical constructs that contribute to a higher functioning.

Evidence supporting the construct validity of the K-BIT was derived from the average raw score increases and decreases. As was expected, based on Cattell and Horn's (1985) theory of crystallized intelligence, crystallized intelligence assessed by the Vocabulary portion increased from 4 to 14 years, leveled off from 16 to 74, and eventually declined only after age 74. Also as expected, fluid intelligence assessed by the Matrices portion of the K-BIT increased from 4 to 17, leveling off from 17 to 19, and steadily decreasing after age 19.

Construct validity was also assessed by comparing scores from the K-BIT to scores obtained on other more established measures of intelligence including the Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983), Wechsler Intelligence Scale for Children Revised (WISC-R; Wechsler, 1974), and the Wechsler Adult Intelligence Scale Revised (WAIS-R; Wechsler, 1981). Canivez (1995) also compared the K-BIT with the Wechsler Intelligence Scale for Children-Third Edition. The K-BIT Vocabulary subtest correlated moderately with the WISC-R Verbal IQ ($r = .78$), the WISC-III Verbal IQ ($r = .80$), the WAIS-R Verbal IQ ($r = .60$), and the K-ABC Achievement Scale ($r = .77$). The K-BIT Matrices subtest correlated moderately with the WISC-R Performance IQ ($r = .50$), the WISC-III Performance IQ ($r = .74$), the WAIS-R Performance IQ ($r = .52$), and the K-ABC Mental Processing Composite ($r = .56$). Prewett (1992) also indicated significant correlations between the K-BIT and the WISC-R. K-BIT correlations with other brief intelligence tests including the Slosson Intelligence Test (Jensen, & Armstrong, 1985), and the Test of Nonverbal Intelligence

(TONI; Brown, Sherbenou, & Johnson, 1982) were in the low to moderate range. The K-BIT was also compared to the Kaufman Test of Educational Achievement (K-TEA; Kaufman & Kaufman, 1985) and the Wide Range Achievement Test Revised (WRAT-R; Jastak & Wilkinson, 1984), which are both individual measures of achievement. The K-BIT IQ Composite correlated moderately with the K-TEA Battery Composite ($r = .73$). The K-BIT IQ Composite correlated low to moderately with the WRAT-R ($r = .30$'s to $.40$'s).

Miller (1995) reviewed the K-BIT and suggested that further validation studies could be useful in determining the K-BIT's utility in areas other than re-evaluations and screenings. Another problem raised by Miller (1995) was that some of the older age ranges in the standardization sample were underrepresented. Overall, the K-BIT seems to be an adequate measure of intelligence that has been the standard for brief intelligence testing for over a decade.

Presently there are two new contenders in the competitive field of intelligence testing. Both measures purport to provide a reliable and valid score after only one half hour of testing. These measures are the Wide Range Intelligence Test (WRIT; Glutting, Adams, & Sheslow, 2000), and the Wechsler Abbreviated Scale of Intelligence (WASI; The Psychological Corporation, 1999). The WASI and the WRIT were both designed to be consistent with the fluid-crystallized theory of intelligence proposed by Horn and Cattell (1967). These two measures provide information in two areas: verbal or crystallized intelligence and performance/visual/nonverbal or fluid intelligence and both provide a global composite score representing general intelligence. Both scales hold that general intelligence or "g" is at the highest level in the hierarchical model of intelligence,

and therefore is generally the most clinically relevant score that can be obtained for the purpose of assessing a person's intelligence. Both scales also hold that verbal or crystallized and performance/visual/nonverbal or fluid intelligence are the two major dimensions that fall directly below general intelligence, and that these dimensions can also provide a more specific understanding of a person's cognitive functioning.

The WRIT (Glutting, Adams, & Sheslow, 2000) was published with the purpose of providing a "measure of intellectual functioning that was responsive to growing contemporary demands for greater clinical efficiency, without sacrificing psychometric integrity" (p. III). It was reported that the WRIT is a test that can measure general, verbal, and visual intelligence in approximately one half hour and still produce scores with estimates of validity that are equal or superior to other lengthier measures of intelligence (Glutting, Adams, & Sheslow, 2000).

The WRIT consists of four subtests, all of which correlate highly with general intelligence. These subtests include Verbal Analogies, Vocabulary, Matrices, and Diamonds. The Verbal Analogies and Vocabulary subtests combine to make up the Verbal/Crystallized measure of intelligence. The Matrices and Diamonds subtests combine to make up the Visual/Fluid measure of intelligence. This test appears to be quite simple to administer because it is so straightforward. According to the authors, this test takes between 20 and 30 minutes to administer depending on the age, ability, and work style of the subject. The materials required for administering this test are minimal, and they include the test manual, easel booklet, and Diamond Chips. Using so few materials contributes to the ease of administration since it is not necessary for the administrator to repeatedly search for materials in a briefcase or bag.

The technical data provided in the WRIT manual are quite extensive. The WRIT standardization sample consisted of 2,285 individuals ranging from 4 to 85 years of age. The reliability (test-retest stability) of the test scores over a time period ranging from 6 to 115 days for a sample of 100 individuals ranged from .90 to .96. The mean increase from the first to the second testing on the WRIT was 5.7 points on the General IQ scale, 4.5 points on the Verbal scale, and 6.6 points on the Visual scale, suggesting that there were some practice effects on this measure as was seen in other established measures of intelligence. What this suggests is that the short-term stability of the WRIT was extremely high, to the point that there is very little measurement error (Murphy & Davidshofer, 1998).

Another measure of reliability reported by Glutting et al. (2000) is interscorer reliability. Interscorer reliability is the level of agreement between scorers on measures that are subjectively scored. The interscorer reliability on the Vocabulary subtest was .98, and the interscorer reliability on the Verbal Analogies subtest was .99 (Glutting et al., 2000). Person and item separation reliabilities ranged from .94 to .97, suggesting that the test can distinguish between people based on the number of correctly answered items (Glutting et al., 2000). The total item separation reliability was .98 or higher, suggesting that “the items on the WRIT are sufficiently separated from easy to hard to form variable lines which are complete and well-spaced” (Glutting et al., 2000, p. 97).

Validity has been described as the extent to which a test measures what it is designed to measure. There are two types of validity addressed in the WRIT manual, the internal validity and the external validity. The internal validity was measured using factor analysis to test the hypothesized two-factor (verbal and visual) model. The authors

hypothesized that the Vocabulary and Verbal Analogies subtests would be associated with a verbal factor, and that the Diamonds and Matrices subtests would be associated with a visual factor. As was hypothesized, this model was supported (Glutting et al, 2000).

External validity (criterion-related validity) refers to how well a measure correlates with other measures. The WRIT was compared to the Wechsler Intelligence Scale for Children Third Edition (WISC-III; Wechsler, 1991), Wechsler Adult Intelligence Scale Third Edition (WAIS-III; Wechsler, 1997), and the Wide Range Achievement Test Third Edition (WRAT3; Wilkinson, 1993). One hundred children between the ages of 6 and 16 were given the WISC-III and the WRIT in counterbalanced order. A statistically significant correlation between the WISC-III FSIQ and WRIT General IQ ($r = .90$) indicated substantial overlap for these two measures. The correlation between the WISC-III VIQ and the WRIT Verbal IQ was also high ($r = .85$). The lowest correlation, between the WISC-III PIQ and the WRIT Visual IQ ($r = .78$) was statistically significant and moderately high. The correlation between the WRIT Visual IQ and the WISC-III VIQ ($r = .76$) and WRIT Verbal and WISC-III PIQ ($r = .78$) were highly correlated despite the fact they purport to assess different constructs due to their associations with the general intelligence factor or “g.”

External validity was also examined between the WRIT and the WAIS-III. One hundred adults averaging 34.1 years of age were given the WAIS-III and the WRIT in counterbalanced order. A statistically significant correlation between the WAIS-III FSIQ and the WRIT General IQ ($r = .91$) indicated substantial overlap between these two measures. The correlation between the WAIS-III VIQ and the Verbal IQ of the WRIT

was also highly significant ($r = .90$). The correlation between WAIS-III PIQ and the WRIT Visual IQ was statistically significant ($r = .85$). The correlation between the WRIT Verbal and the WAIS-III PIQ, and the WRIT Visual and the WAIS-III VIQ were both statistically significant ($r_s = .80$).

Finally, the WRIT and the WRAT3 were compared. The authors explained that they used the WRAT3 since moderately high relationships between tests of academic achievement and tests of academic achievement and tests of intellectual ability have traditionally been a good measure of predictive validity (Glutting et al., 2000, p. 129). Correlations were obtained across four different age levels; 5 year olds, 6-12 year olds, 13-18 year olds, and 19 years and older. "Each of the correlation coefficients in the four tables was significant, at or beyond $p < .01$ " (Glutting et al, 2000, p.130). The WRIT General IQ showed the highest correlation with the WRAT3. As was expected, all areas of the WRIT correlated moderately with all areas of the WRAT3 (r_s ranged from .36 to .64).

Another new brief intelligence test is the Wechsler Abbreviated Scale of Intelligence (WASI; Psychological Corporation, 1999). The WASI consists of four subtests; Vocabulary, Block Design, Similarities, and Matrix Reasoning. These subtests have the highest "g" loading of all Wechsler scale subtests. The Vocabulary and Similarities subtests combine to make up the VIQ/Crystallized measure of intelligence. The Block Design and Matrix Reasoning subtests combine to make up the PIQ/Fluid measure of intelligence. The WASI allows for some flexibility during administration since there is an option of administering either two or four subtests. The two-subtest format can be used when time constraints are a problem and it includes the Vocabulary

and Matrix Reasoning subtests. The two-subtest format requires approximately 15 minutes for administration while the full four-subtest format requires approximately 30 minutes for administration. As previously mentioned, many attempts have been made to create short forms of the Wechsler scales, and the WASI was created in order to overcome some of the problems such as inadequate norms, that have been associated with the short forms of the Wechsler Scales (Silverstein, 1990). An advantage of the WASI is that administration is quite similar to other Wechsler scales, and most psychologists are quite familiar with these measures.

The technical data in the WASI manual shows it was based on a standardization sample of 2,245 individuals between six and 89 years of age. Reliability of the WASI was partially established using the split-half method. The VIQ ($r_s = .92$ to $.95$), PIQ ($r_s = .92$ to $.95$), FSIQ-4 ($r_s = .95$ to $.97$), and FSIQ-2 ($r_s = .92$ to $.95$) reliabilities from the children's sample all suggest that the WASI IQ scores had very little measurement error. Like the child sample, the adult sample also showed high levels of internal consistency; VIQ ($r_s = .92$ to $.98$), PIQ ($r_s = .94$ to $.97$), FSIQ-4 ($r_s = .96$ to $.98$), and FSIQ-2 ($r_s = .93$ to $.98$), suggesting minimal measurement error. Test-retest stability was also assessed with a two-week to twelve-week interval between testing. The average stability coefficient for the 2 child samples was .88 for the 6 to 11 year sample and .93 for the 12 to 16 year sample for the various IQ scales. The average stability coefficient for the 2 adult samples was .87 for the 17 to 54 year sample and .92 for the 55 to 89 year sample for the various IQ scales. Practice effects resulted in scores between 2.6 to 5.8 IQ points higher on the second administration for children, and 1.8 to 3.9 IQ points higher on the second administration for adults. A third type of reliability assessed during the WASI

standardization was interscorer agreement. It was necessary to assess the interscorer agreement since two of the subtests, Vocabulary and Similarities were scored using judgment of the examiner as to the adequacy of the response. The interscorer reliability for Vocabulary ($r = .98$) and for Similarities ($r = .99$) subtests were both quite high suggesting that they are reliably scored.

As was previously mentioned, validity is the extent to which a test measures what it is designed to measure. One measure of validity conducted during the WASI standardization was convergent and divergent validity with other established measures of intelligence. The WASI was correlated with the WISC-III, and both measures were administered in counterbalanced order. A statistically significant correlation between the WASI FSIQ-4 and the WISC-III FSIQ ($r = .87$) and between the WASI FSIQ-2 and the WISC-III FSIQ ($r = .81$), indicated substantial overlap between these two measures. Other correlations between the two measures include the WASI VIQ and the WISC-III VIQ ($r = .76$), and the WASI PIQ and the WISC-III PIQ ($r = .87$). Correlation coefficients were also calculated at the subtest level. The correlations of the WASI and the WISC-III subtests were as follows; Vocabulary ($r = .72$), Similarities ($r = .69$), and Block Design ($r = .74$). The WASI Matrix Reasoning subtest was not correlated on the subtest level because there is no equivalent subtest on the WISC-III. These correlation coefficients suggest that the IQ scales of the WASI measured constructs similar to those measured by the WISC-III.

The WASI was also correlated with the WAIS-III. The two measures were administered in counterbalanced order. Statistically significant correlations between WASI FSIQ-4 and the WAIS-III FSIQ ($r = .92$) and between the WASI FSIQ-2 and the

WAIS-III FSIQ ($r = .87$) indicated substantial overlap of the two measures. Other correlations between the WASI and the WAIS-III included the VIQ ($r = .88$), and the PIQ ($r = .84$). Correlation coefficients were also obtained at the subtest level. The correlation coefficients between the WASI and the WAIS-III were as follows; Vocabulary ($r = .88$), Similarities ($r = .76$), Block Design ($r = .83$), and Matrix Reasoning ($r = .66$). The FSIQ, VIQ, PIQ, and subtest correlations all suggest that the WASI and the WAIS-III were measuring similar constructs.

Finally, the WASI was correlated with the Wechsler Individual Achievement Test (WIAT; The Psychological Corporation, 1992). As was previously mentioned, moderately high correlations between an intelligence test and achievement tests is a sign of a test's predictive validity. The WASI and the WIAT were administered in counterbalanced order. Correlations between the WASI IQ scores and WIAT composite scores range from moderate to high ($r_s = .53$ to $.72$). The pattern of correlations between the WASI and the WIAT was similar to the correlations between the WISC-III and the WIAT. The moderate correlations suggest that the WASI and the WIAT were measuring different but related constructs, as was expected prior to beginning the data collection.

Convergent and divergent validity was assessed by correlating the subtests of the WASI with one another. All subtests of the WASI were found moderately to highly correlated with one another, with correlation factors ranging from the .50s to the .70s. Because the subtests correlated highly with one another, the "g" factor was supported. The subtests correlations also supported the authors' hypothesis that the like subtests (i.e. Vocabulary and Similarities, or Block Design and Matrix Reasoning) would correlate more highly with one another than would dissimilar subtests. Confirmatory factor

analyses determined that as expected, the WASI Vocabulary and Similarities subtests loaded on the Verbal Comprehension factor, while the Block Design and Matrix Reasoning subtests loaded on the Perceptual Organization factor.

To date, there are no published comparisons of the WRIT and the WASI. The only validity studies for either the WRIT or the WASI are those presented in the respective test manuals, and these validity studies compared these tests with more established comprehensive measures of intelligence. The purpose of this study was to gather convergent validity evidence for the WRIT and the WASI. Both the WRIT and the WASI were newcomers to the field of intelligence testing, and therefore it was imperative to assess their validity. There were two main hypotheses for this study. The first of these hypotheses was that the similar IQ scales and subtests of the WRIT and the WASI would be highly correlated since they purport to measure the same or similar constructs. The second hypothesis for this study was that the correlations for dissimilar subtests and IQ scales would also be moderately correlated, although not as highly as the like subtests.

Method

Participants

The sample utilized in this study included 66 students ranging from preschool through high school. Students utilized in this study were either unpaid volunteers or students who had been referred for psychological evaluations. Of the 66 students, 45.5% ($n = 30$) of participants were male and 54.5% ($n = 36$) were female and the mean age of the participants was 11.6 years ($SD = 4.21$, range = 6 to 18). Due to the ethnic makeup of the geographic area in which this study took place, the sample was primarily Caucasian, 98.5% ($n = 65$); while the remainder of the sample was Asian American 1.5% ($n = 1$).

Although participants with suspected disabilities were readily accessible, non-disabled and non-referred students were also utilized. Of the 67 students, 48.5% ($n = 32$) had no special education classification, 37.9% ($n = 25$) of subjects were classified as students with a learning disability, 9.1% ($n = 6$) had been diagnosed with various levels of mental retardation, 3% ($n = 2$) were diagnosed with speech/language disabilities, and 1.5% ($n = 1$) were diagnosed with a developmental delay. Referred students were limited to those in need of re-evaluations, since initial evaluations necessitated a more comprehensive measure of intelligence.

Instruments

Wide Range Intelligence Test. The WRIT is a brief measure of intelligence designed to assess children and adults between the ages of 4 and 85. The WRIT can be administered in less than 30 minutes. Four subtests combine to form the WRIT; the Verbal Analogies and Vocabulary subtests combine to measure Verbal IQ, and the Matrices and Diamonds subtests combine to measure Visual IQ. The Verbal Analogies subtest requires the individual to supply an appropriate word to finish an incomplete sentence. This subtest purportedly measures auditory processing, verbal reasoning, receptive and expressive language ability, as well as long and short-term memory. The Vocabulary subtest requires the subject to provide verbally stated definitions for orally presented words. This subtest measures word knowledge, auditory processing skills, and receptive and expressive language ability. The Matrices subtest requires the subject to look at a picture with one piece missing and determine what picture best follows the pattern set forth by the other pictures. This subtest purports to measure spatial ability, sequential reasoning, attention, impulsiveness and visual acuity. The Diamonds subtest requires the subject to recreate a

stimulus pattern with assorted patterned diamond chips. This subtest is a measure of spatial ability, visual acuity, visual-motor coordination, and short-term visual memory. Three IQ scores were obtained from this test, General IQ, Verbal IQ, and Visual IQ. Each IQ scale has a mean of 100 and a standard deviation of 15.

Wechsler Abbreviated Scale of Intelligence. The WASI is a brief measure of intelligence designed to assess children and adults between the ages of 6 and 89. The WASI requires approximately 30 minutes to administer when using the full battery (FSIQ-4) and 15 minutes when using the abbreviated battery (FSIQ-2). The full battery consists of four subtests; Vocabulary and Similarities subtests combine to measure VIQ, and Block Design and Matrix Reasoning combine to measure PIQ. The abbreviated battery consists of two subtests, Vocabulary and Matrix Reasoning, which assess general intelligence. The Vocabulary subtest requires the individual to provide verbal definitions for orally presented items. This subtest purports to measure expressive vocabulary, verbal knowledge, and fund of information. The Similarities subtest requires the individual to describe a link between two like objects. This subtest is a measure of verbal concept formation as well as abstract verbal reasoning ability. The Block Design subtest requires the individual to construct an exact replica of a visually presented stimulus using patterned blocks. This subtest is a measure of spatial visualization, visual-motor coordination, and abstract conceptualization. The Matrix Reasoning subtest requires the individual to look at a picture missing a section and decide which of the possible choices best follows the pattern of the stimulus picture. This subtest is a measure of nonverbal fluid reasoning. Four IQ scores were derived from this test, Full Scale IQ – Four Subtest (FSIQ-4), Full Scale IQ – Two Subtest (FSIQ-2), Verbal IQ (VIQ), and Performance IQ

(PIQ). All IQ scores on the WASI are based on a mean of 100 and a standard deviation of 15.

Both tests consist of a record form, a manual, a stimulus booklet, Diamond Chips for the WRIT and Pattern Blocks for the WASI. A stopwatch was the only additional item necessary to conduct this study. Global scores for the two instruments, as well as subtest scores on the WRIT are reported in terms of an intelligence quotient or “IQ” with a mean of 100 and a standard deviation of 15. The subtest scores for the WASI are reported in terms of a *T* score with a mean of 50 and a standard deviation of 10.

Procedure

Permission was obtained from the principals of the schools at which the study took place. The teachers were then informed about the study and asked for their assistance in finding children who were able to participate in the study (Appendix B). Permission forms (Appendix A) were sent home along with a letter explaining various aspects of the study. Participants were chosen from the group of children whose parents or legal guardians granted permission. Children referred for evaluation were tested using the consent for evaluation obtained for the case study.

During testing, the two tests were administered in counterbalanced order to control for possible order effects. Each student was tested during a single test session. Four test administrators were utilized, however this researcher tested 59 of the 67 students. All test administrators were professionally trained in psychometric testing, and certified school psychologists and school psychologist interns conducted testing in a manner consistent with professional practice.

The subtest scores of the WASI were converted from *T* scores to standard scores ($M = 100$, $SD = 15$) so that the subtest scores on both the WRIT and the WASI were in the same measurement units. Pearson product-moment correlation coefficients were calculated to assess the levels of convergent validity between the various scales of the WRIT and the WASI. Dependant *t*-tests were calculated between corresponding scales of the two instruments to assess differences between scores yielded by these different instruments. Effect size estimates were calculated using Δ (Glass & Hopkins, 1996).

Results

The convergent validity between the two tests was assessed on multiple levels. Pearson product moment correlations were used to compare the WRIT and the WASI Global IQ and subtest standard scores. It was expected that the measures of convergent validity would be high between the tests since they have very similar structures purporting to measure the same constructs. Dependant *t*-tests were conducted in order to examine the differences between the mean IQ's of the two tests. The hypotheses regarding these tests were that there would be no mean differences between similar scales of the two measures.

Global Scale Comparisons

Correlation coefficients between the corresponding IQ scores of the WRIT and the WASI are presented in Table 1. All correlations between corresponding IQs were statistically significant ($p < .01$). The correlations between the corresponding WRIT and WASI IQ scores ranged from .68 to .85. The correlation between the WRIT General IQ and the WASI FSIQ-4 was .85, while the correlation between the General IQ of the WRIT and the WASI FSIQ-2 was .83. The correlation between the Verbal IQs of the

WRIT and the WASI was also high ($r = .82$). Although still moderate to high, the correlation between the Visual IQ of the WRIT and the Performance IQ of the WASI ($r = .78$) was slightly lower than that of the Verbal IQs.

Table 2 presents the dependant t -test results for similar IQ scales of the WRIT and the WASI. Students obtained equivalent WRIT General IQ and WASI FSIQ-4 scores, $t(65) = 1.42$, *ns*. Students also obtained equivalent WRIT General IQ and WASI FSIQ-2 scores, $t(65) = 1.74$ *ns*. The mean difference between the WRIT Verbal IQ and the WASI VIQ was also not significant, $t(65) = .31$, *ns*. However, students scored significantly higher on the WRIT Visual IQ scale than on the WASI PIQ, $t(65) = 2.50$, $p < .05$, but the effect size was small ($\Delta = .24$).

Subtest Comparisons

The subtest correlation coefficients between the WRIT and the WASI were also examined. The strongest correlation among the subtest scores was for the Vocabulary scores on the WRIT and the WASI ($r = .80$). The WRIT Verbal Analogies subtest and the WASI Similarities subtest, although similar in underlying theory, differ slightly from one another in practice. However these subtests still correlated moderately with one another ($r = .68$). The WRIT Matrices subtest and the WASI Matrix Reasoning subtest were also moderately correlated ($r = .69$). Finally, the WRIT Diamonds subtest and the WASI Block Design correlated moderately as well ($r = .71$).

Subtest means were also compared using dependant t -tests. Students obtained equivalent WRIT Vocabulary and WASI Vocabulary subtest scores, $t(65) = 1.90$, *ns*. Scores obtained on the WRIT Verbal Analogies subtest and the WASI Similarities subtest were also equivalent, $t(65) = .033$, *ns*. However, on average, students scored

significantly higher on the WRIT Diamonds subtest than on the WASI Block Design Subtest, $t(65) = 3.23$, $p < .01$, but the effect size was small ($\Delta = .33$). Finally, the scores obtained on the WRIT Matrices subtest were equivalent to those obtained on the WASI Matrix Reasoning subtest, $t(65) = 1.69$, ns. Although statistically significant, the mean differences between the WRIT Visual IQ scale and the WASI PIQ, as well as the WRIT Diamonds subtest and the WASI Block Design subtest, were not large and were within the standard errors of measurement for both measures.

Discussion

Until recently, there were very few intelligence tests specifically designed for a brief administration. The most frequently used of these tests was the Kaufman Brief Intelligence Test (K-BIT, Kaufman & Kaufman, 1990). The K-BIT was the only available option for nearly a decade when conducting a brief measure of cognitive ability. The K-BIT is not a shortened version of any other Kaufman batteries; rather it was designed and standardized independently.

The present study examined the convergent validity of two new brief intelligence tests, the Wide Range Intelligence Test (WRIT) and the Wechsler Abbreviated Scale of Intelligence (WASI) among a sample of elementary, middle, and high school students. Convergent validity between the like scales of the WRIT and the WASI was significant. As hypothesized, moderately high positive correlations ranging from moderate to high (r s = .68 to .85) were found between the various like scales of the WRIT and the WASI. The General IQ scale of the WRIT correlated highly with the FSIQ-2 ($r = .83$) and FSIQ-4 ($r = .85$) scales of the WASI, indicating strong convergent evidence of construct validity. The Verbal IQ scale of the WRIT correlated highly with the VIQ scale of the WASI ($r =$

.82). The Visual IQ scale of the WRIT also correlated highly with the WASI PIQ ($r = .78$).

The correlations between the WRIT and the WASI were significant and were similar to those found between the WRIT and more comprehensive measures of intelligence including the Wechsler Intelligence Scale for Children-Third Edition and the Wechsler Adult Intelligence Scale-Third Edition (Glutting & Sheslow, 2000). The correlations between the WRIT and the WASI were similar to those found between the WASI and more comprehensive measures of intelligence including the Wechsler Intelligence Scale for Children-Third Edition and the Wechsler Adult Intelligence Scale-Third Edition (The Psychological Corporation, 1999). These results are also similar to those correlations found by Canivez (1995), between the K-BIT and the WISC-III.

The magnitudes of these correlation coefficients (r^2), which are presented in Table 1, represent the shared variance between the various scales of these two tests. The 69% shared variance between the WRIT General IQ and the WASI FSIQ-2 suggests that these scales of the WRIT and the WASI appear to be measuring general intelligence. Likewise, the WRIT General IQ and the WASI FSIQ-4 shared 72% of the variance suggesting that they also measured general intelligence. The Verbal IQ of the WRIT and the VIQ of the WASI also appear to measure similar constructs since they shared 66% of variance. Finally the 61% shared variance between the Visual IQ of the WRIT and the PIQ of the WASI suggests that these scales also measured similar constructs.

The aforementioned correlations between the WRIT and the WASI are approximately equivalent to those correlations each test had with longer traditional IQ tests as reported in the WRIT and WASI manuals (WRIT; Glutting et al., 2000; WASI;

Psychological Corporation, 1999). Correlations found in the WRIT manual between the WISC-III FSIQ and WRIT General IQ ($r = .90$), the WISC-III VIQ and the WRIT Verbal IQ ($r = .85$), and the WISC-III PIQ and the WRIT Visual IQ ($r = .78$) were all significant and moderately high. The correlations between the WAIS-III FSIQ and the WRIT General IQ ($r = .91$), the WAIS-III VIQ and the Verbal IQ of the WRIT ($r = .90$), and the WAIS-III PIQ and the WRIT Visual IQ were all significant ($r = .85$). According to the WASI manual significant correlations were also found between the WASI FSIQ-4 and the WISC-III FSIQ ($r = .87$) and between the WASI FSIQ-2 and the WISC-III FSIQ ($r = .81$). Other correlations between the two measures included the WASI VIQ and the WISC-III VIQ ($r = .76$), and the WASI PIQ and the WISC-III PIQ ($r = .87$). The WASI was also compared to the WAIS-III and was reported in the WASI manual. The WASI FSIQ-4 and the WAIS-III FSIQ ($r = .92$) and the WASI FSIQ-2 and the WAIS-III FSIQ ($r = .87$) were highly correlated. Other correlations between the WASI and the WAIS-III included the VIQ ($r = .88$), and the PIQ ($r = .84$). These correlations were also similar in strength to those found between the K-BIT and the WISC-III by Canivez (1995). The VIQ of the WISC-III and the Vocabulary of the K-BIT ($r = .80$), the PIQ of the WISC-III and the Matrices of the K-BIT ($r = .74$), and the FSIQ of the WISC-III and the IQ Composite of the K-BIT ($r = .76$) were all statistically significant. These correlations were similar to those found between the WRIT and the WASI, which supports the concurrent validity of the WRIT and the WASI as brief estimates of cognitive ability.

Also as expected, the verbal/nonverbal correlation of the WRIT Verbal IQ and the WASI PIQ ($r = .65$) was lower than the convergent associations mentioned previously. Additionally, the verbal/nonverbal correlation between the WRIT Visual IQ and the

WASI VIQ ($r = .67$) was lower than the convergent correlations between these two measures. These Verbal/Nonverbal correlation coefficients were moderately high despite the fact they purport to assess different constructs due to their associations with the general intelligence factor or “g.” The high verbal/nonverbal correlations between the WRIT and the WASI may be explained by Macmann and Barnett’s (1994) contention that verbal and performance factors could be described “as truncated or degraded versions of the general factor.”

At the subtest level, all WRIT subtests were significantly correlated with all subtests of the WASI. Although the correlations on the corresponding subtests were for the most part lower than those between the corresponding IQ scales, they are statistically significant and moderate to high ($r_s = .68$ to $.80$). The highest subtest correlation was between the Vocabulary subtests ($r = .80$), suggesting that the vocabulary subtests of these two measures are assessing very similar constructs. The Verbal Analogies subtest of the WRIT and the Similarities subtest of the WASI experienced a moderately strong positive correlation ($r = .68$) suggesting that they are measuring similar constructs. The Diamonds subtest of the WRIT and the Block Design subtest of the also experienced a moderately strong positive correlation ($r = .71$) despite the differences between the tasks required by these subtests. Finally, the Matrices subtest of the WRIT and the Matrix Reasoning subtest of the WASI experienced a moderately strong positive correlation ($r = .69$) indicating that these subtests are assessing similar constructs. These correlations are similar to those found between the similar subtests of the WASI and the WISC-III, and the WASI and the WAIS-III (The Psychological Corporation, 1999).

The shared variance of the similar WRIT and WASI subtests ranged from moderate to high. The WRIT Vocabulary subtest and the WASI Vocabulary subtest had 64% shared variance. The 46% shared variance of the WRIT Verbal Analogies subtest and the WASI Similarities subtest was moderate in magnitude, and was the lowest of all similar subtests. The 50% shared variance of the WRIT Verbal Analogies and the WASI Vocabulary subtest was slightly higher than that of the WRIT Verbal Analogies and the WASI Similarities. The 50% shared variance of the WRIT Diamonds subtest and the WASI Block Design subtest indicated a moderate overlap. Finally, the 48% shared variance for the WRIT Matrices subtest and the WASI Matrix Reasoning subtest was moderate.

The correlations among the dissimilar subtests of the WRIT and the WASI were lower than those for convergent associations, as would be expected given the different constructs being assessed by the various subtests. With the exception of the correlation between the Verbal Analogies subtest of the WRIT and the Vocabulary subtest of the WASI ($r = .71$), all convergent correlations between these subtests were higher than the correlations between the various dissimilar subtests. The correlations of the Vocabulary subtest of the WRIT with the three subtests other than Vocabulary of the WASI were significant and moderate in magnitude: Similarities ($r = .66$), Block Design ($r = .55$), and Matrix Reasoning ($r = .59$). The correlations of the Verbal Analogies subtest of the WRIT with the three subtests other than Similarities of the WASI were also statistically significant and moderate in magnitude: Vocabulary ($r = .71$), Block Design ($r = .54$), and Matrix Reasoning ($r = .50$). Finally, the correlations of the Diamonds subtest of the WRIT with the three subtests of the WASI other than Block Design were also statistically

significant and moderate in magnitude: Vocabulary ($r = .52$), Similarities ($r = .56$), and Matrix Reasoning ($r = .53$).

Mean IQ and subtest scores were compared between corresponding scales of the WRIT and the WASI in order to assess if any statistically significant discrepancies existed. One discrepancy existed between the WRIT and the WASI on the IQ scale level. This discrepancy was between the Visual IQ scale of the WRIT and the PIQ scale of the WASI $t(65) = 2.50, p < .05$. In addition to the discrepancy between these two IQ scores, a discrepancy also existed between the WRIT and the WASI on the subtest level. This discrepancy was between the Diamonds subtest of the WRIT and the Block Design subtest of the WASI $t(65) = 3.23, p < .01$. These discrepancies were similar to those found by Canivez (1995) between the K-BIT Matrices subtest and the WISC-III PIQ $t(136) = 2.11, p < .05$. The mean differences between the IQ scales of the WRIT and the WISC-III as reported in the WRIT manual (Glutting et al., 2000) ranged from .4 on the VIQ of the WISC-III and the Verbal IQ of the WRIT to 2.2 on the PIQ of the WISC-III and the Visual IQ of the WRIT. These differences were small and similar to those found between the WRIT and the WASI, however these differences were not statistically analyzed and could therefore not be directly compared to the T scores obtained in this study. The mean differences between the IQ scales of the WASI and the WISC-III as reported in the WASI manual (Psychological Corporation, 1999) ranged from .2 on the VIQ scales to 1.1 on the FSIQ-2 and FSIQ scales. The WASI and the WAIS-III mean differences ranged from .1 on the FSIQ-2 of the WASI and the FSIQ of the WAIS-III to .4 on the FSIQ-4 of the WASI to FSIQ of the WASI (Psychological Corporation, 1999). These differences were also small and similar to those found between the WRIT and the

WASI, but were not statistically analyzed making direct comparisons to the T scores obtained in this study impossible. The aforementioned discrepancies between the WRIT and the WASI were statistically significant at or beyond the $p < .05$, however these discrepancies were well within the standard error of measurement for both measures, and were therefore not practically significant.

The results of this study provide convergent evidence for the construct validity of the WRIT and the WASI. Psychologists using the WRIT or the WASI can be confident that these tests are measuring similar constructs of intelligence. There are potential limitations to this study that should be addressed in future research. One limitation was that all of the students who participated in this study were from rural Midwest areas and were primarily Caucasian. This sample's limited geographic and ethnic diversity limits the generalization to other racial/ethnic groups. Another limitation to the current study was the relatively small sample size. A larger sample size would allow for more stable estimates of correlations and for factor analysis to be completed to provide additional evidence of construct validity. Both the WRIT and the WASI were designed to assess children and adults alike, however this study only utilized children between the ages of six and eighteen. Utilizing a sample with older individuals would provide insight to how these measures compare with a wider age range of individuals. Further studies of these cognitive ability measures should utilize a larger, more representative sample in order to overcome the aforementioned limitations.

Conclusions

The WRIT and the WASI have both correlated highly with other more established intelligence tests during their standardizations. Results of this study were generally as

hypothesized. The results of this study indicate that these measures correlate highly with one another. These correlations suggest that the WRIT and the WASI evidence a high degree of convergent validity, indicating that these tests are measuring similar constructs.

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Table 1

Pearson Product-Moment Correlation Coefficients between the Wide Range Intelligence Test (WRIT) and the Wechsler Abbreviated Scale of Intelligence (WASI)

WASI	WRIT						
	Verbal	Visual	General	VOC	VA	D	MAT
VIQ	.82(.66)	.67(.45)	.80(.64)	.78(.61)	.73(.53)	.67(.45)	.56(.31)
PIQ	.65(.42)	.78(.61)	.76(.58)	.63(.40)	.57(.32)	.75(.56)	.68(.46)
FSIQ-2	.78(.61)	.77(.59)	.83(.69)	.77(.59)	.66(.44)	.73(.53)	.68(.46)
FSIQ-4	.79(.62)	.79(.62)	.85(.72)	.76(.58)	.71(.50)	.77(.59)	.67(.45)
VOCAB	.82(.67)	.62(.38)	.77(.59)	.80(.64)	.71(.50)	.62(.38)	.52(.27)
SIM	.72(.52)	.64(.41)	.72(.52)	.66(.44)	.68(.46)	.61(.37)	.56(.31)
BD	.59(.35)	.67(.45)	.67(.45)	.55(.30)	.54(.29)	.71(.50)	.53(.28)
MR	.59(.35)	.74(.55)	.71(.50)	.59(.35)	.50(.25)	.64(.41)	.69(.48)

Note. r^2 s presented in parentheses. All correlations significant $p < .01$. WRIT = Wide Range Intelligence Test; WASI = Wechsler Abbreviated Scale of Intelligence; VIQ = Verbal IQ; PIQ = Performance IQ; FSIQ-2 = Full Scale IQ-2 Subtest; FSIQ-4 = Full Scale IQ-4 Subtest, VOCAB = Vocabulary; SIM = Similarities; BD = Block Design; MR = Matrix Reasoning; VOC = Vocabulary; VA = Verbal Analogies; D = Diamonds, MAT = Matrices. $N = 66$. Correlations in bold represent correlations between like subtests.

Table 2
Descriptive Statistics and t Tests for WRIT and WASI IQ and Subtest Comparisons

	<i>M</i>	<i>SD</i>	Range	<i>t</i>	<i>p</i>	Δ
WRIT VERB IQ	92.36	16.50	42 – 117	0.31	.755	.03
WASI VIQ	91.98	15.77	55 - 126			
WRIT VIS IQ	96.23	19.02	43 – 136	2.50*	.015	.24
WASI PIQ	92.58	15.44	55 - 127			
WRIT GEN IQ	93.33	19.05	35 - 130	1.42	.159	.12
WASI FSIQ-4	91.55	15.75	52 - 129			
WRIT GEN IQ	93.33	19.05	35 – 130	1.74	.086	.15
WASI FSIQ-2	91.06	15.84	55 - 124			
WRIT VOC	91.26	17.03	37 – 120	1.90	.063	.17
WASI VOCAB	88.73	17.61	55 - 129			
WRIT VA	94.65	15.26	57 – 126	-0.03	.974	.003
WASI SIM	94.70	16.92	55 - 123			
WRIT D	97.44	16.48	45 – 137	3.23*	.002	.33
WASI BD	92.50	15.89	58 - 130			
WRIT M	95.85	18.75	49 – 136	1.69	.097	.20
WASI MR	92.86	17.73	55 - 127			

Note. *df* = 65 for all comparisons. WRIT = Wide Range Intelligence Test; WASI = Wechsler Abbreviated Scale of Intelligence; VIQ = Verbal IQ; PIQ = Performance IQ; FSIQ-2 = Full Scale IQ-2 Subtest; **FSIQ-4** = Full Scale IQ-4 Subtest, VOCAB = Vocabulary; SIM = Similarities; BD = Block Design; MR = **Matrix** Reasoning; VOC = Vocabulary; VA = Verbal Analogies; D = Diamonds, MAT = Matrices. * $p < .05$ with Bonferonni correction for family wide error rate = .006 (.05/8).

Appendix A

Student Permission Form

Dear Parent or Guardian,

I am seeking students to participate in my thesis study of the relationship between two brief measures of intelligence. Your child's participation is completely voluntary and will not impact your child's educational placement. All data collected will be kept confidential and steps will be taken to protect the anonymity of your child, no personal information will be collected. Testing will be conducted during school hours and your child will miss very little class time since these measures are both quite brief. Most testing will occur during times such as study hall, PE, and other non-core classes. If you have any questions regarding this study, please contact Jason Collins at (217) 555-1212. If you do not have any questions regarding this assessment, please return the bottom portion of this page to the school. Please be sure to check the appropriate box at the bottom of the page.

Thank you very much for your cooperation. I greatly appreciate it!

☐ I give permission for my child to participate in the assessment detailed above.

☐ I do not give permission for my child to participate in the assessment detailed above.

Child's Name

Parent Signature

Date

* If you would like a copy of the results of this study, print your name and address in the spaces provided below.

Name

Address

*****Teachers please return signed forms to the EIASE mailbox located within your school!!!***

Appendix B**Teacher Memo****MEMO:**

Hello, my name is Jason Collins, School Psychology Intern working with Jane Doe, School Psychologist for your district during the 2001-2002 school year. I am doing research that compares two brief measures of intelligence. My goal over the next several months is to test as many children as I can in order to see how these measures function. I am asking you to pass out permission slips to the children in your classroom. Any returned permission slips should be left in the EIASE mailbox. Thank you for your time and effort.

Sincerely

Jason Collins